

High-tech quality inspection in pulp & paper manufacturing

Industry Challenges: Quality, Speed, and Sustainability

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INTRODUCTION:

The pulp, paper, and board industry face growing demands for higher product quality standards, driven by ever more stringent customer requirements. End-users require defect-free surfaces for printing and packaging, increasingly making quality control crucial in preventing costly product rejections and maintaining market competitiveness. Simultaneously, production speeds have significantly increased, with modern paper machines often operating at 2,000 meters per minute or above. At such speeds, detecting small defects accurately and promptly becomes challenging.

Additionally, paper manufacturers face pressures to reduce energy consumption and minimize their environmental footprint. Traditional inspection methods often require intensive lighting setups, increasing both energy usage and operational costs. Moreover, the wide variety of defect types—from pinholes and thin spots to surface scratches and color variations—necessitates flexible, accurate, and reliable inspection technologies.

New modern cameras combining imaging technologies while addressing industry challenges

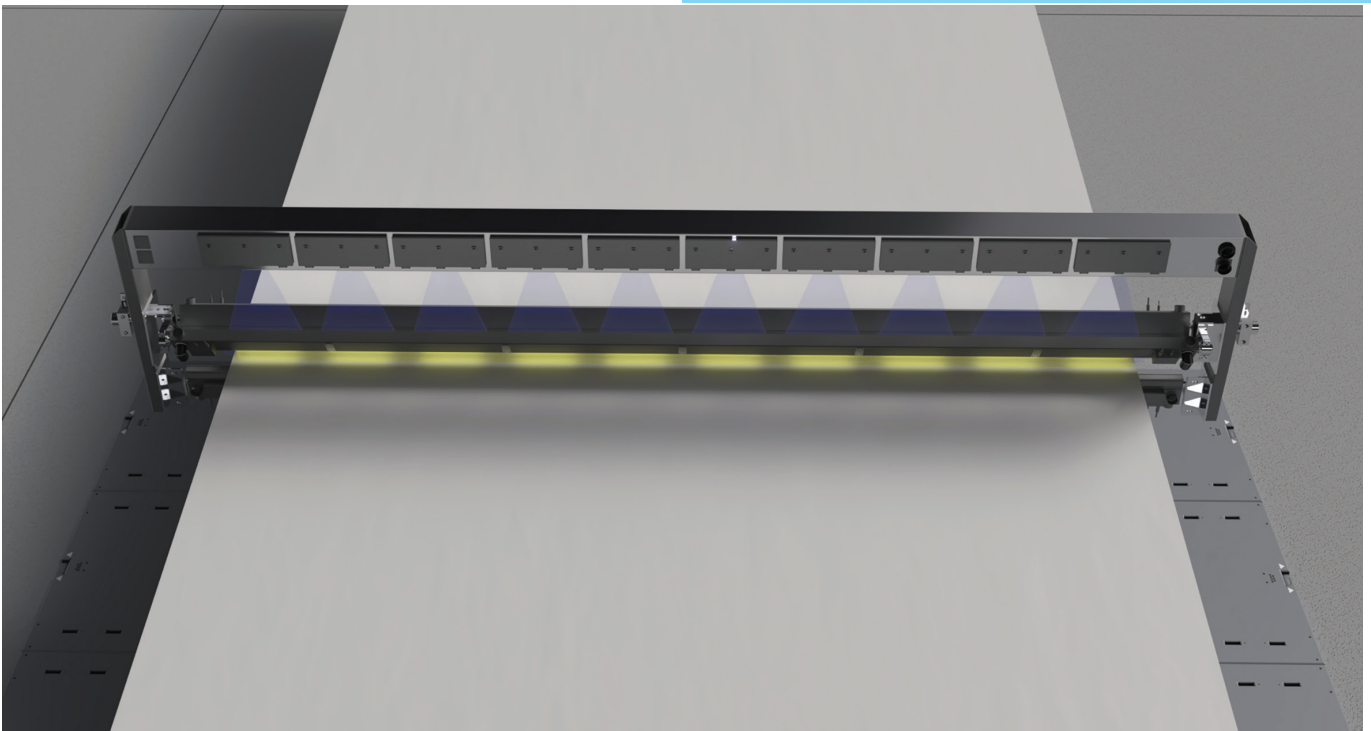
High Dynamic Range (HDR) Imaging

On heavy grades, significant light intensity is typically required to detect impurities effectively. However, with high-intensity lighting, formation defects, such as thin spots, can falsely appear as real holes. High Dynamic Range imaging addresses this challenge by accurately distinguishing between actual defects like holes and surface irregularities like thin spots. HDR technology performs multiple parallel scans at varying exposure levels, merging these scans into a detailed composite image. This method ensures clear visibility of both bright and dark defects simultaneously, significantly enhancing detection accuracy and minimizing false defect alerts.

Combined Optical Setups (COMBI Mode)

Traditionally, identifying diverse defect types required multiple optical setups, complicating the inspection system and increasing infrastructure requirements. COMBI Mode addresses this by combining multiple optical inspection setups into one streamlined solution. Utilizing one camera bank equipped with multiple illumination channels, COMBI Mode performs simultaneous scans under various illumination conditions. This consolidated approach reduces hardware complexity, installation space, and overall investment costs, enabling efficient and comprehensive inspection with minimal infrastructure.





Time Delay Integration (TDI)

At high production speeds, traditional imaging methods often necessitate intense lighting to clearly capture fast-moving defects, leading to increased energy and cooling demands. Reducing illumination typically results in darker images with lower contrast between the material and defects such as dirt spots. TDI technology addresses this by capturing the production line multiple times and overlaying these sequential exposures. This cumulative imaging approach boosts image brightness and contrast, effectively counteracting reduced illumination power. Consequently, TDI technology provides superior image quality, enhanced sensitivity, and substantial operational cost savings through significantly lower illumination and cooling requirements.

Advanced Sensor and Camera Technology for color inspection

High-speed paper production demands rapid and precise defect detection capabilities. Advanced sensor technologies, including tri-linear color sensors combined with a high-resolution monochrome channel, capture defects at extremely high resolutions (up to 16 x 8,000 pixels at scan rates up to 400 kHz). Tri-linear sensors offer distinct advantages such as maintaining full resolution, producing true color images, and ensuring superior overall image quality. This advanced imaging captures minute defects with remarkable clarity and detail, even at maximum production speeds, enabling precise classification and ensuring optimal product quality. Additionally, incorporating both color and monochrome channels significantly improves the accuracy of defect identification by simultaneously analyzing intensity and color variations.

Introducing NovaCore: A Comprehensive Quality Inspection Solution

ISRA VISION's NovaCore web inspection system integrates these cutting-edge imaging technologies—HDR imaging, COMBI Mode, TDI, and advanced sensor arrays—to address the industry's critical challenges comprehensively. By combining multiple inspection methodologies into a unified system, NovaCore significantly improves defect detection accuracy, reduces false positives, and enhances operational reliability.

The integrated use of HDR imaging within NovaCore ensures robust detection of varied defect types regardless of lighting conditions, thereby improving reel grading accuracy and reducing customer complaints.

NovaCore's COMBI Mode simplifies system architecture, reducing space and maintenance requirements, further lowering installation and operational costs. TDI technology within NovaCore dramatically reduces energy consumption by minimizing lighting requirements, aligning perfectly with sustainability and cost reduction goals.

NovaCore's sophisticated sensor and camera technology ensures accurate defect detection and classification at high production speeds, providing detailed real-time analytics to facilitate rapid corrective actions, improving production stability and consistency. Moreover, advanced AI-driven classification modules enhance operational ease, significantly reducing training requirements and the potential for human error.

Customer Benefits: Efficiency, Reliability, and Sustainability

NovaCore directly translates technological innovation into tangible benefits:

- **Improved Quality Assurance:** Accurate detection and classification of defects ensure consistent product quality, reducing customer claims and waste.
- **Cost and Energy Efficiency:** Lower illumination requirements, simplified hardware, and reduced complexity significantly lower operational and maintenance costs.
- **Reliability and Robustness:** Compact, durable system designs suitable for harsh industrial environments ensure consistent performance and reduced downtime.
- **Ease of Operation:** AI-driven defect classification simplifies user training and enhances operational efficiency, supporting scalability and optimal workflows.

Conclusion: A Forward-Looking Solution

ISRA VISION's NovaCore effectively combines advanced vision technologies and intelligent analytics into a single solution tailored to the unique demands of the pulp and paper industry. It not only addresses existing challenges but also prepares manufacturers for future quality and sustainability requirements, offering a comprehensive, efficient, and reliable approach to high-speed quality inspection.